

Initial	Date
CW	4-6-99

BA WTR  
BA SD  
Mail Stop 60189

APR 06 1999

To: Refuge Manager, Lake Andes National Wildlife Refuge

From: Chief, Division of Water Resources

IS/ CHERYL C. WILLISS

Subject: 1998-99 Water Use Report/Water Management Plan

The subject report for Lake Andes National Wildlife Refuge has been reviewed and approved with the following comment:

We note the report does not reference Roth WPA, Permit No. 6013-3. The application was submitted to DENR April 1997 for impoundment of 323 acre-feet storage with an additional 212 acre-feet to be appropriated to offset evaporation. Please complete and return the attached *Form 10, Notice of Completion of Works and Application of Water to Beneficial Use*, when water has been put to beneficial use. We will submit to DENR so that an inspection can be scheduled and a Water License issued.

Thank you for the timely submission of this report.

Attachment

bcc: WTR rf  
RO rf  
Refuges Supervisor, Wright  
WTR:LCOE:4/5/99  
W:\WATERUSE\SO\_DAKOT\99\LANDE.99

October 21, 1997

Note to file.

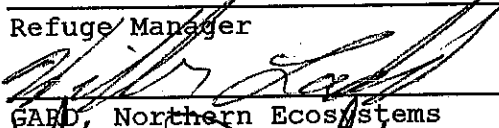
Called the Chief Engineer, Water Rights Program, SD DENR regarding the "NOTICE OF COMPLETION OF WORKS AND APPLICATION OF WATER TO BENEFICIAL USE" which was included with the South Dakota Water Permit No. 6013-3 for the Roth WPA. It was unclear to me on just how to fill out this form. I spoke with Jenny McMath. She advised me that we should not have received the form since our water permit stated that the ditch plug was existing. Ms. McMath advised me to not fill out the form and consider our water permit completed. She stated that she would place a note in our file regarding my call and her response. I called Linda Coe in our Water Rights Division and told her about the form and phone call.


Steven A. Hicks


**LAKE ANDES  
NATIONAL WILDLIFE REFUGE**

**ANNUAL WATER MANAGEMENT PLAN  
1998 WATER USE REPORTS  
1999 RECOMMENDATIONS**

Submitted: \_\_\_\_\_  
Refuge Manager

Approved:  \_\_\_\_\_  
GARD, Northern Ecosystems

Concur:  \_\_\_\_\_  
Refuges Supervisor

Reviewed:  \_\_\_\_\_  
Chief, Div. of Water Resources

Date: \_\_\_\_\_

Date: 4/7/99

Date: 4/7/99

Date: 4-5-99

**1999 ANNUAL WATER MANAGEMENT PLAN  
AND  
1998 WATER CONDITIONS AND USAGE**

**LAKE ANDES NATIONAL WILDLIFE REFUGE COMPLEX  
LAKE ANDES, SD**

**WATER UNIT: Lake Andes**

**I. Introduction**

Lake Andes is a 4730 acre meandered lake whose water level depends entirely upon annual runoff. Two dikes divide the lake into three units, the North, Center and South. Stoplog water control structures are located within each dike, however, the lack of a permanent water supply precludes any water level manipulations.

Drainage area size and surface acres for each unit of Lake Andes are shown below. Maximum and average depth figures were determined in 1962.

Unit	Drainage Area Acres		Surface Acres of Water	Water Capacity (Acre Feet)	Depth/full	
					Max	Avg
South	20,000	24%	1,760	16,159	13.5	11.5
Center	11,000	14%	2,359	18,000	14.5	12.9
North	<u>53,000</u>	<u>62%</u>	<u>611</u>	<u>3,015</u>	<u>10.5</u>	<u>9.1</u>
TOTAL	84,000	100%	4,730	37,174	--	--

In 1922, Congress passed a bill establishing a high water elevation of 1437.25 feet msl for Lake Andes via the construction of an artificial outlet on the South Unit. This level was established following local complaints about flooding around the lake. The Fish and Wildlife Service received the right to flood the meandered lake bed of Lake Andes in an easement acquired in 1939 from the State of South Dakota.

**II. Objectives**

As long as water is present in Lake Andes, it is utilized by water dependent wildlife species year round. It serves primarily as a roost and stop over for migrating waterfowl. Fair brood habitat exists in the North Unit and poor brood habitat exists in the remaining portion of the lake. The objective for Lake Andes is to provide as much habitat as possible for nesting and migrating waterfowl under current weather conditions.

### **III. 1998 Water Conditions**

Total precipitation for 1998 was 26.82 inches, 5.41 inches above normal. The winter was relatively mild and open with sporadic moderate snowfalls. Minor snow melt runoff contributed to the partial filling of all three units. Precipitation after ice out was normal with the exception of April when 5.85 inches of precipitation occurred during the month. The lake filled and remained at or just below the high water elevation of 1437.25 feet msl until freeze-up.

<u>1998 Lake Andes Water Levels - Feet MSL</u>			
<u>Date</u>	<u>North Unit</u>	<u>Center Unit</u>	<u>South Unit</u>
01/02	1436.9	1436.7	1436.7
05/19	1437.7	1437.7	1437.5
09/21	1436.7	1436.6	1436.6
10/27	1436.7	1436.7	1436.7
11/20	1437.0	1436.9	1436.9

### **IV. Ecological Effects of the Past Years Levels on Lake Andes**

Between 1987 and 1992, Lake Andes was suffering from the lack of adequate rainfall and runoff. During this time, all three units came very close to becoming void of water. The low water conditions, however, stimulated an increase in aquatic vegetation, preparing the lake for excellent habitat once water again became available. In addition, limited rough fish control was achieved by fish die offs in both the summer of 1992 and winter of 1992-93. The remaining rough fish were primarily found in the south unit. Unfortunately, by 1994 rough fish were found in excessive numbers throughout all areas of Lake Andes.

Heavy precipitation occurred in 1993 resulting in significant runoff events and significant increases in water elevations. Water flowed over both the North and Center Unit dikes. Unit levels during 1994 remained steady to slightly decreasing when compared to the 1993 levels. Slight decreases in the amount of visible aquatic plant life was also noticed in 1994. A deluge of water again occurred in 1995. Water flowed over both the North and Center Unit dikes. 1996 water levels remained at the high water mark. Emergent and submergent aquatic vegetation greatly decreased.

In 1997, runoff and precipitation began to raise the water level in excess of the highwater mark once again. To prevent water from overflowing the dikes, the stop logs were taken out of the South Unit structure to allow unrestricted flow. Water levels remained above the high water mark during the summer months, but did not top over the dikes. Water levels in 1998, remained at the high water mark.

Rough fish populations continue to be at high levels and are negatively impacting all aquatic vegetation and water quality in all

three units of Lake Andes. This condition limits the effectiveness of Lake Andes to provide quality habitat conditions for waterfowl.

The colonial nesting bird colony in Johnsons Bay (of Lake Andes) did not nest in 1992 nor 1993. In 1994, the colony made a come back in Johnsons Bay and established a new colony on Owens Bay. The colony capitalized on the 1995, 1996 and 1997 water conditions which provided excellent nesting and forage areas in the flooded young cottonwood trees in Johnsons Bay. The colony established on Owens Bay left in 1996. Primary nesters in the colony are black-crowned night herons, cattle egrets, great egrets, cormorants and great-blue herons.

#### **V. 1999 Water Management Objectives**

Management objectives for 1999 are to maintain the water level at the 1437.25 feet msl elevation by containing as much runoff as possible in Lake Andes. Excess water will continue to be released by overflow.

### **WATER UNIT: Owens Bay**

#### **I. Introduction**

The Owens Bay Unit is a 240 acre marsh unit separated by a dike from the South Unit of Lake Andes. A stoplog water control structure is located in this dike to allow water releases into Lake Andes. This Unit also includes three man-made ponds (Prairie Ponds) which are located along the northwest shore of Owens Bay.

Owens Bay, in addition to water from natural runoff, is maintained by a free flowing artesian well. The well, drilled in 1957, originally had a 1000 gpm flow and water right. Well shutdowns during the 1973 DVE outbreak resulted in casing destruction and new casing had to be installed. The new casing reduced the well opening from 12 inches to 8 inches and dropped the flow to approximately 450 gpm.

In 1986, Ducks Unlimited funded the drilling of a new 12 inch artesian well and the old well was capped. The new well has a 800-1000 gpm flow. The well distribution box and pipeline supplying the Prairie Ponds were also replaced. The four water control structures on the Prairie Ponds were retrofitted with new screw gates in 1987.

Two of the screw gates were replaced in 1997 with stoplog structures (in Prairie Ponds 2 and 3), and two additional stoplog structures placed for better water level manipulation. The two new structures allow flow from Prairie Ponds 2 and 3 directly to Lake Andes.

The artesian well and rainfall are the water resources used to fill the Prairie Ponds.

## **II. Objectives**

Owens Bay water management objectives are to provide emergent marsh conditions on one-half of the unit (shallow water margins) with an overall water/vegetation interspersation rate of 50% and open water habitat on the other half of the unit that supports adequate submerged aquatic bed resources which are available to nesting/brooding hens and ducklings. Waterfowl production is the primary objective on Owens Bay. Secondary objectives include providing habitat for migrating waterfowl and other water dependent species such as marsh and water birds, shorebirds, gulls and terns.

## **III. 1998 Water Conditions**

The water level in Owens Bay had been lowered in 1997 by a partial drawdown to stimulate germination of robust emergent vegetation (cattail and bullrush) and increase the diversity of invertebrates by providing vegetative structure. This objective was accomplished by the germination of a narrow band of cattail. The drawdown water level was retained throughout the fall and winter which provided a limited carp winter kill.

As spring snow melt and precipitation began to raise the water level in the bay, 1998 water level manipulation began with the release of water into Lake Andes. A complete drawdown was the 1998 objective. Unfortunately, water levels in the South Unit precluded the total dewatering of the area as did the siltation in the ~~outlet~~ channel. The 1998 partial drawdown did, however, create a second band of exposed mudflat which dried sufficiently to provide substrate for plants such as nutsedge and goosefoot.

The estimated area of the exposed soils vs. open water in 1998 was at a 60% to 40% ratio. The remaining open water area was between 6-12" in depth.

### **1998 Water Levels - Owens Bay**

<u>Date</u>	<u>Water Level</u>
01/02	1438.7
05/19	1437.6
09/21	(*See note)
10/27	1437.2
11/20	1437.5

(\*The water level for 09/21 was too low to record.)

Pool Bottom	1436.52
Full Pool Elevation	1442.12

All three Prairie Ponds were completely drawn down during the 1998 growing season and reflooded in the fall prior to migration.

#### **IV. Ecological Effects of the Past Years Levels on Owens Bay**

Owens Bay water levels remained high during the wet years, 1993-96, and before water level manipulation was attempted. The heron and egret colony established in 1994 was heavily used by cattle egrets, great egrets, great-blue herons and black-crowned night herons until the trees became unattractive in 1996. This colony was made possible by cottonwood trees becoming established at the perimeter of the bay during the previous drought years and subsequent reflooding.

The partial drawdowns on Owens Bay have resulted in increased brood habitat for waterfowl and exposed mudflat for migrating and nesting shorebirds. Two distinct bands of vegetative growth have greatly increased the diversity of invertebrates. Conditions prior to drawdown were such that the majority of the unit was open water with a limited cattail shoreline edge. Extensive submerged aquatic vegetation, primarily pondweeds, existed. However, during the high water events in 1996 and 1997, carp entered the unit and now pose a concern for water quality and aquatic vegetation.

All three Prairie Ponds were drawn down completely during the 1997 and 1998 growing season to reestablish an interspersion of open water and robust emergent vegetation and to allow construction/rehab work on the structures. The draining and drying of the soil released nutrients and made them available for a diversity of plants to germinate and grow. During the interim fall/winter period, the units were reflooded to provide migratory waterbird habitat. The ponds as well as Owens Bay were utilized by all common waterfowl species.

In 1997, ten avocet pairs were observed utilizing the newly exposed shoreline on Owens Bay. Many of the birds were displaying breeding/brood rearing behavior, however, no young birds or nests were found to confirm this activity.

#### **V. 1999 Water Management Objectives**

Water levels in Owens Bay will be managed at a moderate level. Runoff and rainfall will be retained to the level that will inundate existing vegetation without killing the cattail that germinated during the 1998 growing season. Mudflat areas will still be provided in areas within the bay.

All three Prairie Ponds will be reflooded during 1999. Prairie Ponds 1 and 2 will be maintained at a moderate level for the next few years to serve as brood habitat for waterfowl. [Once open water areas become extensive and the invertebrate community becomes depopulated, a cycle of drawdowns should be initiated on both Ponds again.]

The water level in Prairie Pond 3 will be kept high in 1999 to eliminate the woody vegetation in the unit.



## **WATER UNIT: Broken Arrow Waterfowl Production Area**

### **I. Introduction**

The Broken Arrow WPA is a 2650 acre tract in Douglas and Charles Mix Counties. Two drainage systems existed on the property when purchased. The Mud Lake Drain has an upstream watershed of 25,600 acres while the second system, the Joubert Drain, has a 12,320 acre watershed. Five ditch plugs or low head dams with concrete stoplog control structures were installed in 1979 along the drainage ditches, two on the Mud Lake Drain and the remaining three on the Joubert Drain. Dam #6 was constructed below Dam #2 on the Mud Lake Drain in 1984. Dam #7 on the Joubert Drain was constructed during the fall of 1986 in cooperation with Ducks Unlimited who funded the project design and construction. Then in 1991, the five water control structures were retrofitted. Stoplog structures replaced the nonfunctional stoplog liftgate structures.

A water rights permit for the storage of 131.2 acre feet of water was granted by the South Dakota Department of Water and Natural Resources. The impoundment at capacity covers 56.4 surface acres. The development increased the quantity of pair habitat by creating 5.9 miles of shoreline. The maximum depth is 6.5 feet. Design specifications for the seven dams are as follows:

<u>Embankment Volume YD<sup>3</sup></u>	<u>High Water Contour</u>	<u>Surface Acres</u>	<u>Acre-feet Impounded</u>
Dam #1 - 76	Unk	6.2	5.7
Dam #2 - 755	Unk	27.9	82.6
Dam #3 - 2761	Unk	43.6	163.0
Dam #4 - 586	Unk	34.7	88.3
Dam #5 - 137	Unk	6.3	5.2
Dam #6 - 900	Unk	30.0	Not determined
Dam #7 - 5470	1526.0	56.4	131.2
TOTAL		205.1	476.0

The capability to manipulate water levels is very limited on the Broken Arrow WPA. Impoundments can be drawn down as objectives dictate. However, reflooding depends primarily on spring runoff and the amount of water stored in the either the Mud Lake system or the Joubert Drain system. Minimal capability to flood when desired is possible. In 1998, all pools were maintained at half pool elevations to encourage the growth of aquatic vegetation.

## **II. Objectives**

Habitat for waterfowl production is the primary management objective for the Broken Arrow WPA. The habitat provided also benefits marsh and water birds, shorebirds, gulls, terns and raptors. Secondary benefits are provided to resident wildlife. A short duration grazing system is used for upland management.

## **III. 1998 Water Conditions**

The winter of 1997-98 was relatively mild with moderate snow pack in the Broken Arrow drainage. Total precipitation is not monitored on site, however, it was similar to that of Lake Andes NWR which was near normal.

## **IV. Ecological Effects of the Past Years Water Levels on the Broken Arrow WPA**

All impoundments within the Broken Arrow WPA experienced excellent growth in the pool bottoms by hydric plant species during the drought years. During the 1993 high water levels, water was retained in all pools except Dam #3. This structure was washed out in 1993 and not repaired until 1994. The pool was considered in a drawn down condition prior to and after the repair of this structure. Dramatic aquatic plant growth resulted from this drawdown event and shorebird use was high. Subsequent reflooding of this pool did not occur until 1995. All other pools remained in good condition through 1995. However, the structures were not designed to handle the amount of water received in 1995, resulting in emergency spillways operating at maximum levels.

Normal springtime precipitation in 1996-98 allowed the desired recharge of wetlands within the two storage systems. 1996 water levels were kept below the 1995 levels with the largest impoundment in partial drawdown condition.

Although, the water control structures allow water manipulation only moderate control can be obtained which proves to be very frustrating at times.

Rough fish are creating high turbidity problems similar to that of Lake Andes.

## **V. 1999 Water Management Objectives**

Water management objectives for 1999 are to maintain water levels similar to that of 1998 in all impoundments. This level equates to the impoundments being half full. No pools will be held at maximum level.

**WATER UNIT: Karl E. Mundt National Wildlife Refuge**

The Karl E. Mundt NWR borders the Missouri River in Gregory County. The refuge was established in 1974 to protect habitat important to wintering bald eagles. The only water on the unit itself is located within four small (less than 1 acre) stock ponds that are used in conjunction with the grazing program, and a one half acre pond fed by a free flowing artesian well. There is presently no active management of water on the Karl E. Mundt Refuge.

**WATER UNIT: Sherman Waterfowl Production Area  
SD Water Permit No. 5251-3**

This water permit is for sufficient runoff water annually to fill the Sherman WPA to an elevation of 1591.7 feet msl. The Sherman WPA is located in a portion of the W $\frac{1}{2}$  Section 3; E $\frac{1}{2}$ NE $\frac{1}{4}$  Section 9; NW $\frac{1}{4}$ NW $\frac{1}{4}$  Section 10; all in T. 98 N., R. 66 W., Charles Mix County. The permit establishes first priority to 271 feet of an undivided interest in a total of 323 acre feet of water stored in a natural basin on both the Sherman WPA and private land at elevation 1591.7 feet msl. The water appropriated shall be used for the purpose of providing fish and wildlife habitat.

**WATER UNIT: Varilek Waterfowl Production Area  
SD Water Permit No. 5250-3**

This water permit is for sufficient runoff water annually to fill the Varilek WPA to an elevation of 1614.0 feet msl. The Varilek WPA is located in the E $\frac{1}{2}$  Section 11, T. 98 N., R. 66 W., Charles Mix County. The permit establishes first priority to 139 acre feet of an undivided interest in a total of 190 acre feet of water stored in a natural basin both on the Varilek WPA and private land at elevation 1614 feet msl. The water appropriated is used for the purpose of providing fish and wildlife habitat.